Health Threats, Land Loss, Risk Anxiety: Addressing the Cumulative Effects of Gulf Storms on Louisiana's Bayou Communities with Education & Advocacy

John Sullivan: Sealy Center for Environmental Health & Medicine / NIEHS Center in Environmental Toxicology @ UTMB

Bryan Parras: T.e.j.a.s.; SHRON; Independent Fimmaker

NIEHS Involvement in Louisiana, post-Katrina

- National directive from NIEHS Director
- Environmental sampling efforts coordinated through University of Iowa, Duke University, Miami University
- NIEHS Community Outreach & Education Core medical supply efforts: UTMB @ Galveston, MD Anderson / UT Smithville CRED
- Community Environmental Health & Risk Outreach Pilot Project: “Hurricane Readiness: a Way of Life on the Bayou”
- 2nd level Hurricane Readiness “Master Class” follow-up

Concept Inputs for Hurricane-Focused Tox & Risk Pilot Project

- Based on CBPR model
- CDC epidemiological surveillance
- Data from post-Katrina environmental monitoring & TRI / HAZ Waste facilities damage
- Informal environmental health survey: environmental advocates, medical practitioners, citizens

CBPR: Community Based Participatory Research:

"…a collaborative approach to research that equitably involves all partners in the research process and recognizes the unique strengths that each brings. CBPR begins with a research topic of importance to the community, and has the aim of combining knowledge with action and achieving social change to improve health outcomes and eliminate health disparities.

Campus Community Health Partners: Community Based Participatory Research Resources, 2000

Data from CDC Surveillance & Environmental Monitoring

- CDC highest incidence causes of morbidity / mortality:

  rescue phase: injury, direct exposure to pathogens (***vibrio*** et al.), chronic medical needs

  recovery phase: respiratory distress, chronic medical needs, mental health

Environmental Monitoring

- Mold & Bacterial Endotoxins
- Water-Borne Pathogens
- Toxic agents: spills, slicks, sheens & emissions

New Orleans water-damaged homes

Mold Genera Encountered

Predominantly:

- *Aspergillus*
- *Penicillium*
- *Trichoderma*
- *Zygomycetes*
- *Paecilomyces*

Also:

- *Scopulariopsis*
- *Basidiospores*
- *Cladosporium*
- *Chaetomium*
- *Curvularia*

- **Mold and microbial hazards are typical of flood damage**
  - High concentrations (≈ high occupational levels)
  - Expected flora (*Penicillium/Aspergillus*, GNB)

- **Hazards are extreme**
  - Susceptible individuals should not be exposed
  - For others personal protection is required
  - N95 respirator will not provide adequate protection at these levels of exposure

Peter Thorne, PhD. (University of Iowa)

Environmental Sampling: Airborne Bacterial Endotoxin:

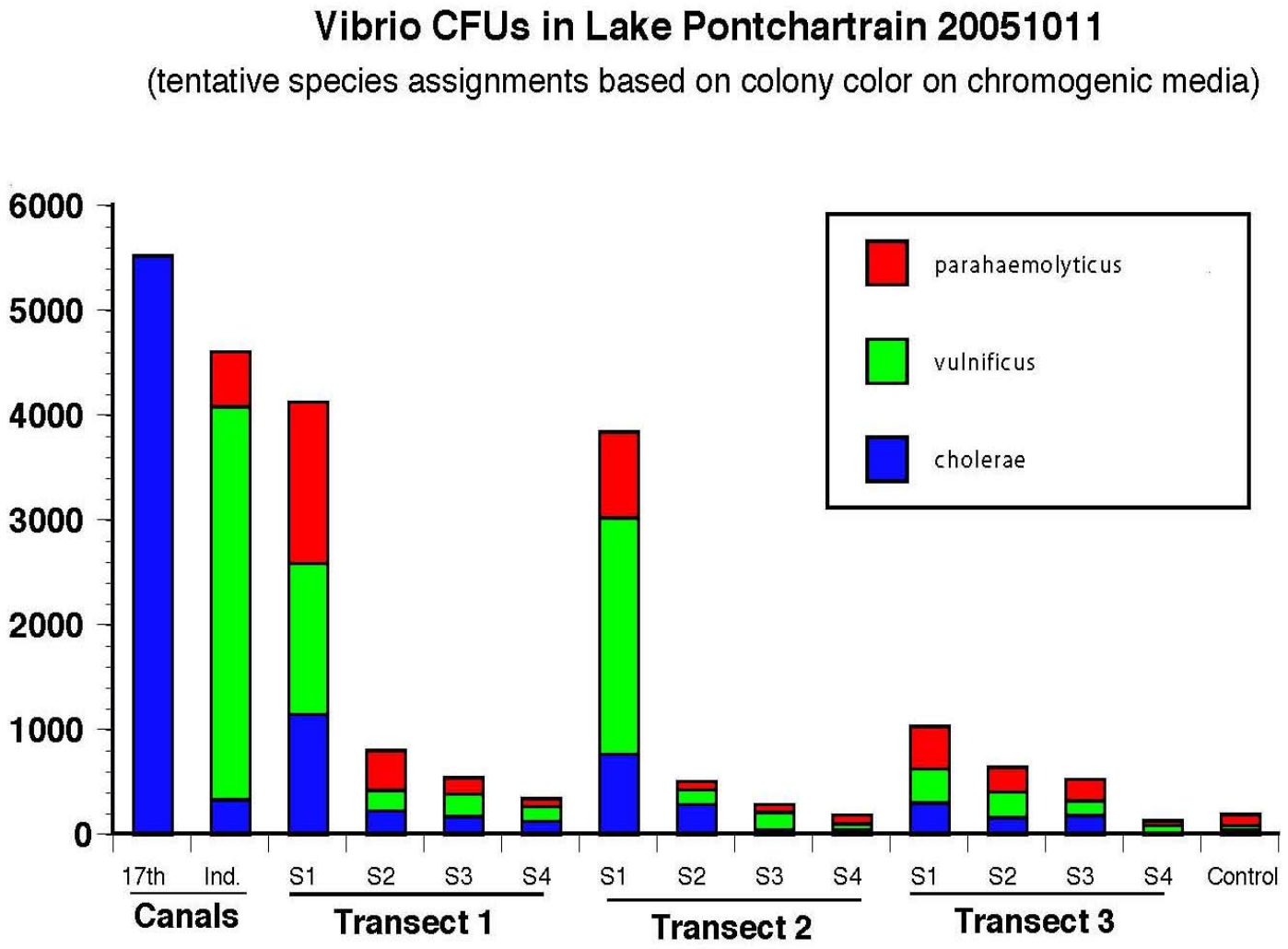
- They are more than 200 times higher than expected for homes.
- The values are in the range of occupational and agricultural levels.
- They are 30 times the no effect level for respiratory symptoms (i.e. 50 EU/m^3).

Peter Thorne, Phd. (University of Iowa)

Hurricane Katrina Response: Microbes and HABs

Using Remote Sensing, targeted sampling of Lake Pontchartrain and Canals for:

- Microbes
  - indicator organisms (E coli, Enterococcus)
  - Pathogenic bacteria (Cholera, Vibrio, Staph, Bacteroides)
  - Viruses (Enterovirus, Norovirus, Coliphage)
  - Protozoa (Cryptosporidium, Giardia)
- HABs
  - Cyanobacteria
- Heavy metals and Hydrocarbons
- Environmental parameters



Laura Fleming, PhD. University of Miami / NIEHS

Key issues concerning chemical contamination:

- composition
- bioavailability
- transformation

- distribution among media

- temporal changes

- toxicities

- mixtures

Chemicals of greatest concern?

Metals (Pb, Hg, As)

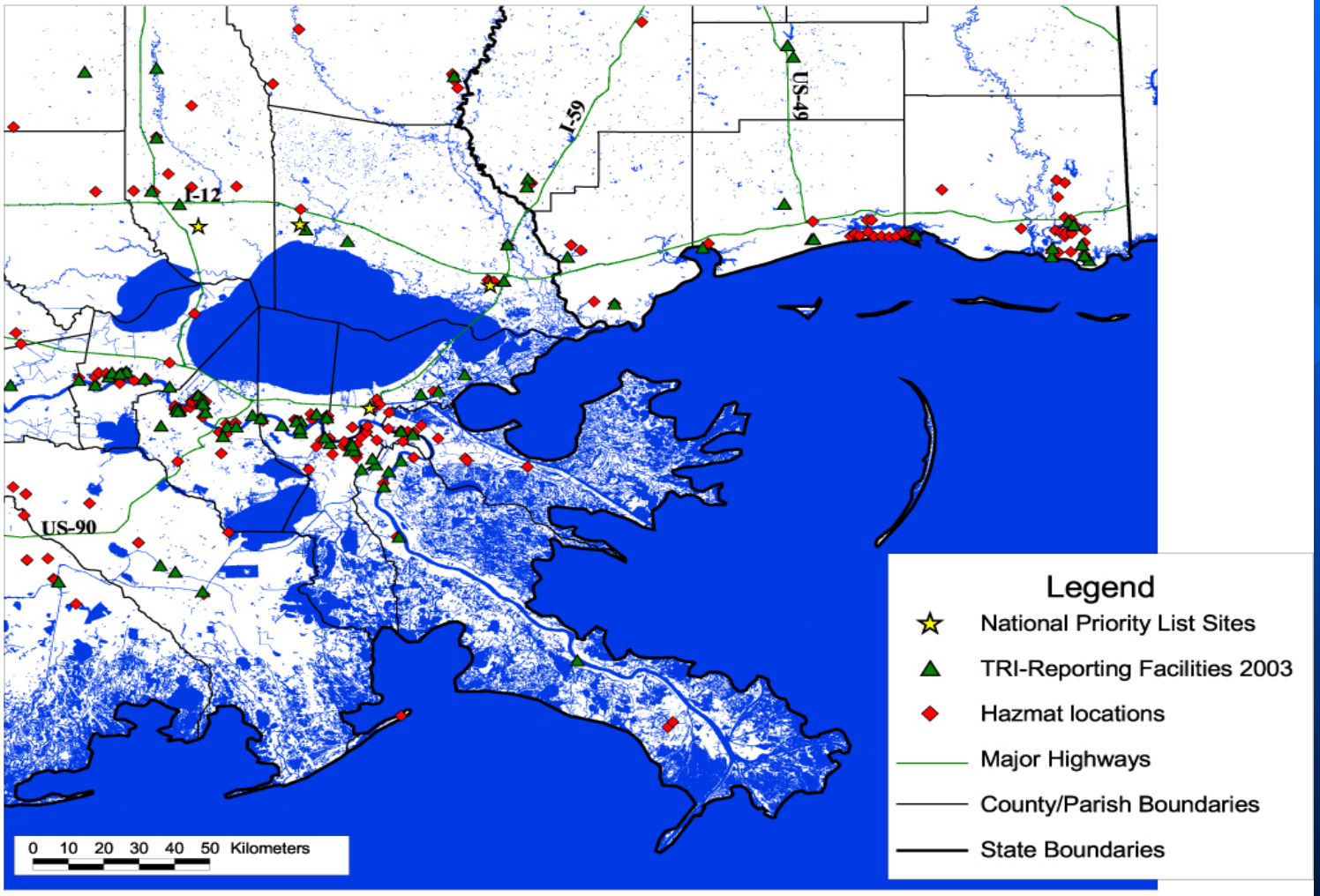
Volatile organic compounds

Polycyclic aromatic hydrocarbons

Pesticides (particularly modern insecticides)

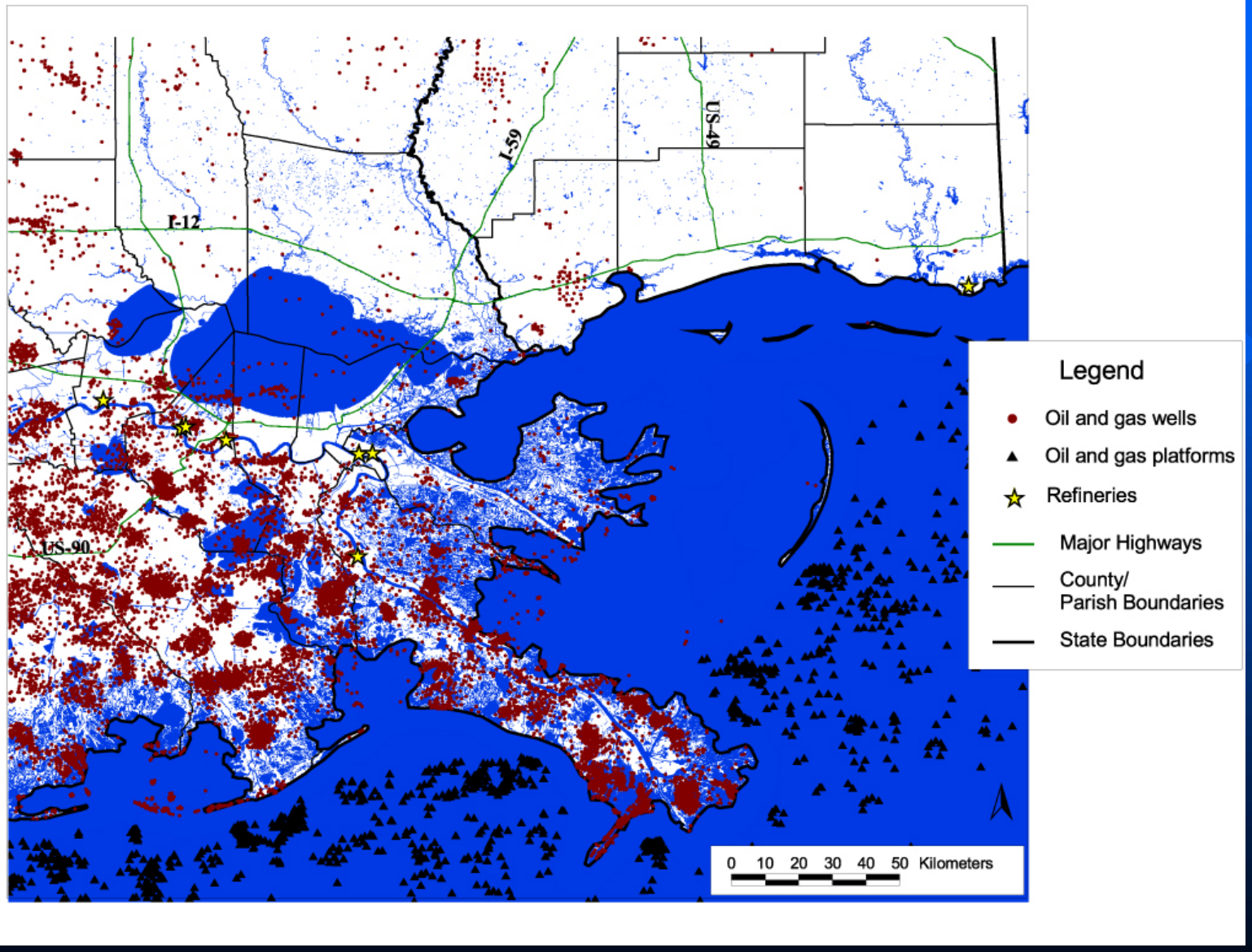
Dioxins & furans

Assessing Potential Exposure Hazards

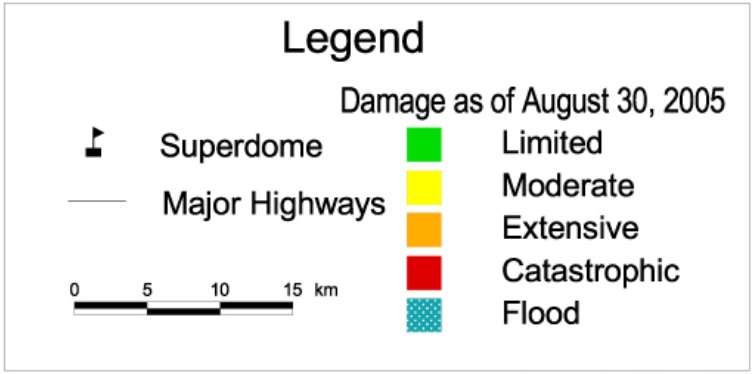


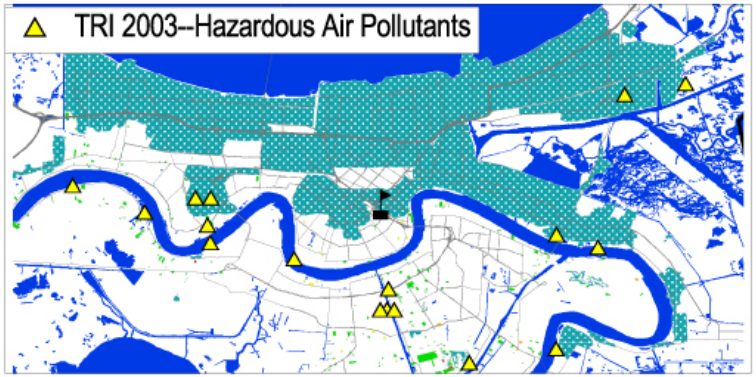
GIS maps by Marie Lynn Miranda, PhD. (Duke University)

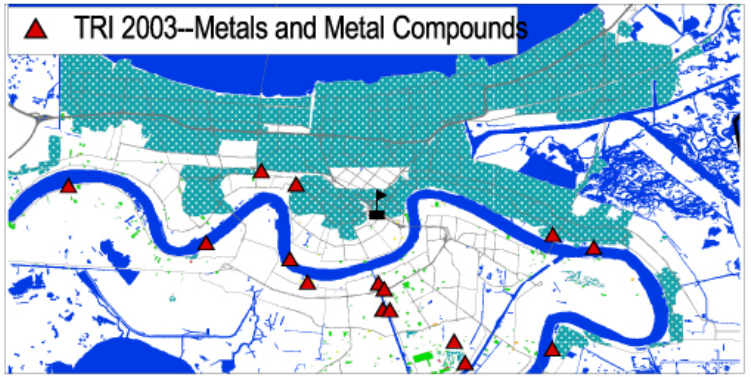
Distribution of Petrochemical Exploration, Production, Refining Sites

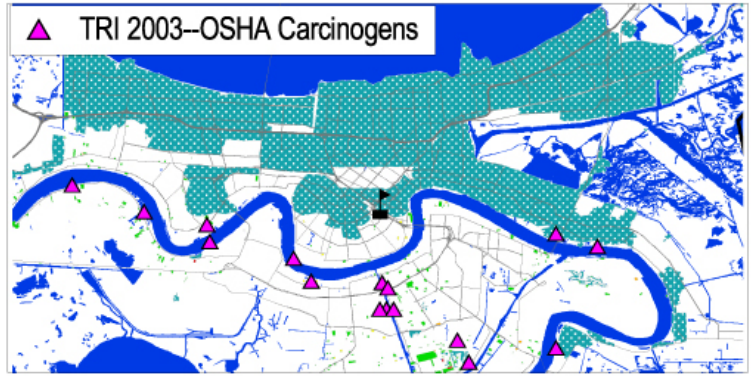


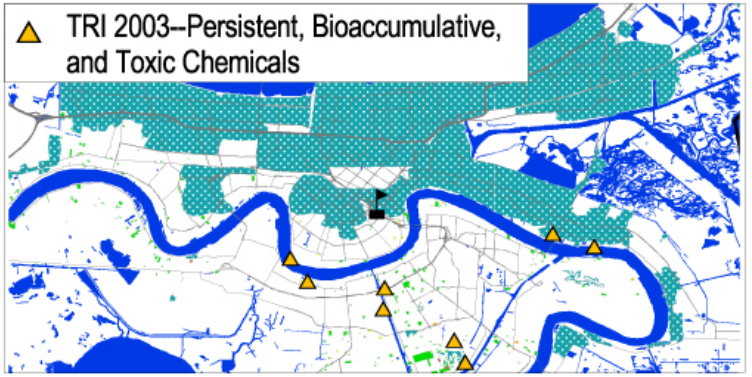
Damage to TRI Reporting Facilities as Consequence of Hurricane Katrina



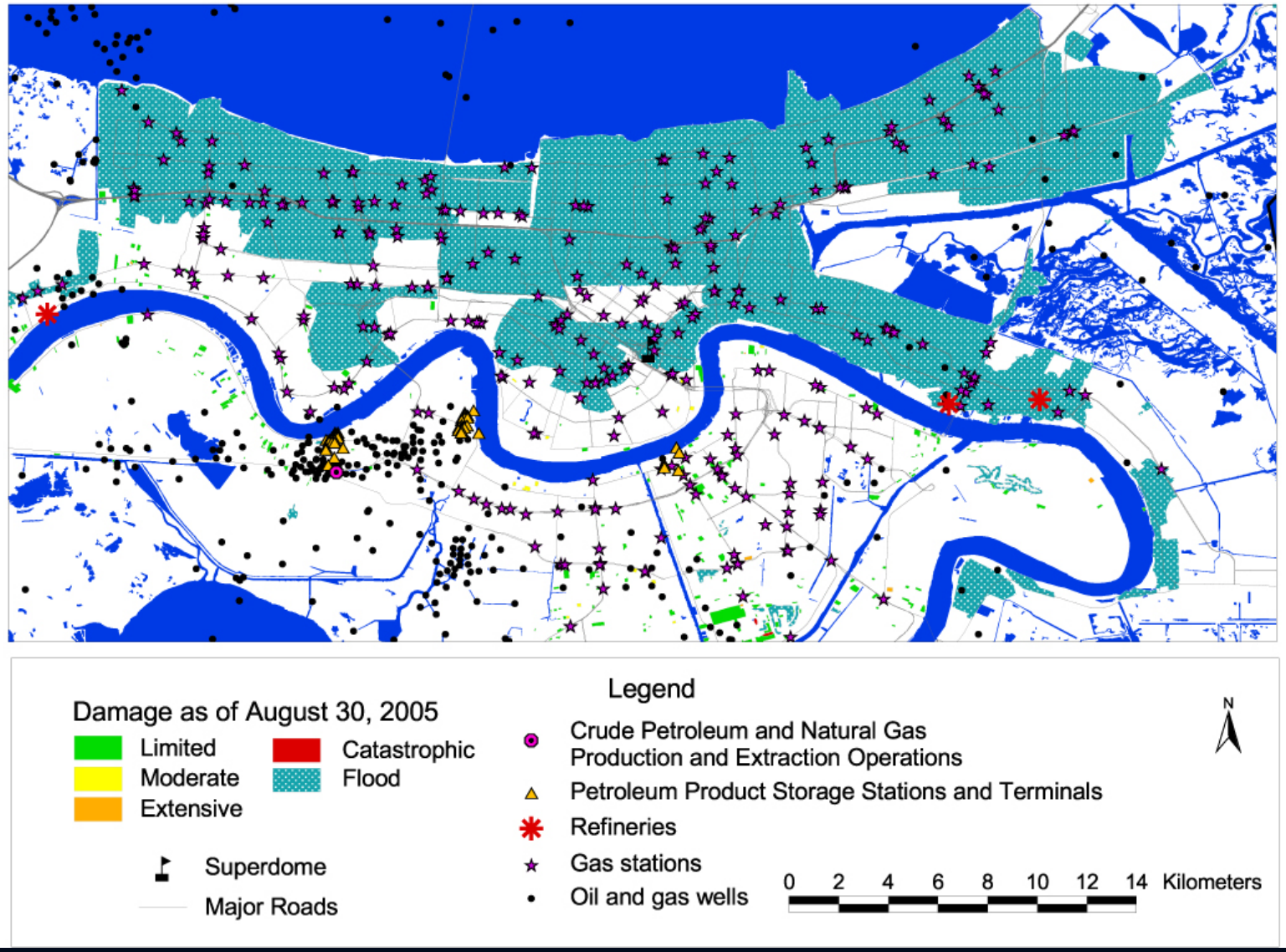








Damage to Petroleum & Natural Gas Extraction, Processing, Storage Facilities



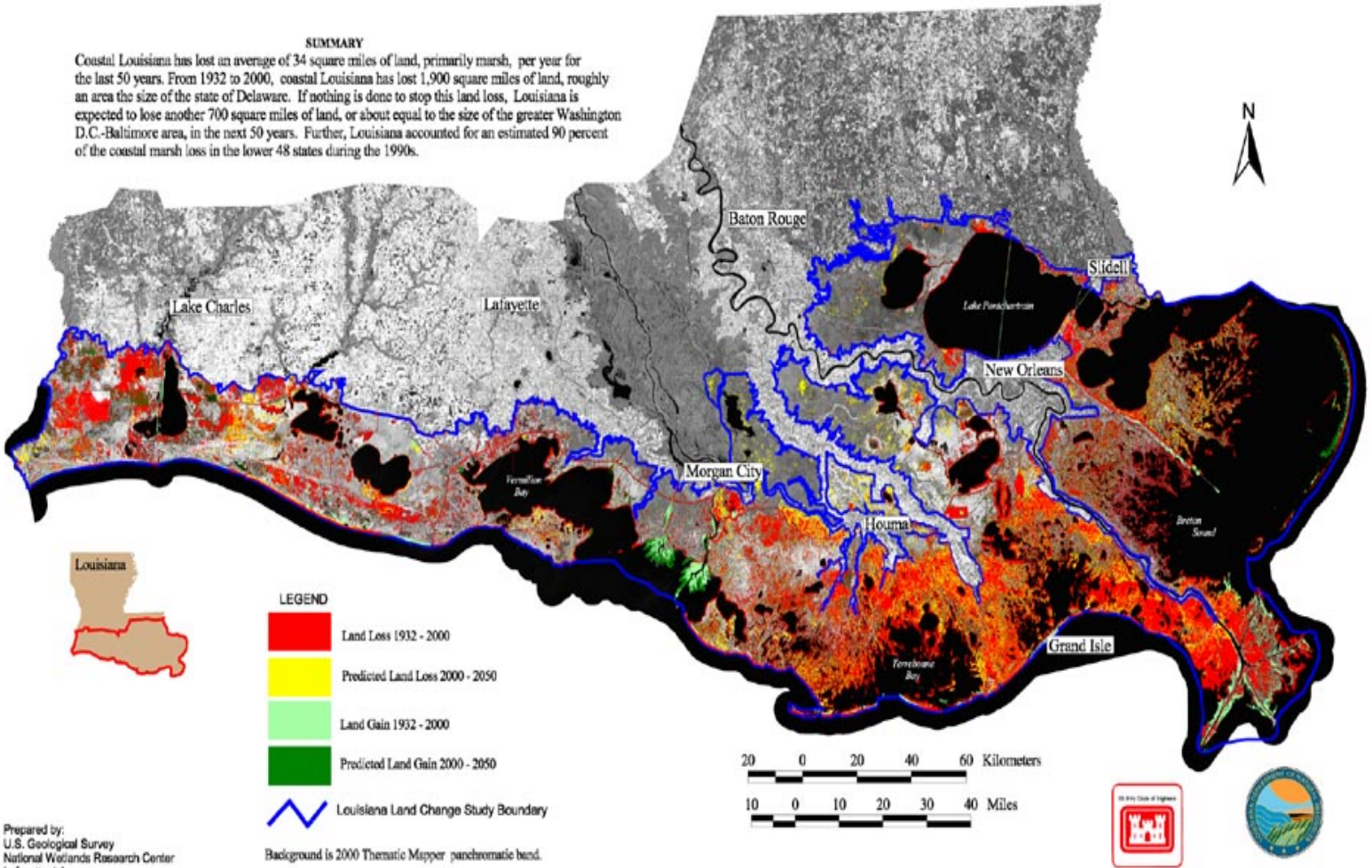
A Legacy of Coastal Erosion, Subsidence & Salt-Water Infiltration

100+ Years of Land Change for Coastal Louisiana

USGS
science for a changing world

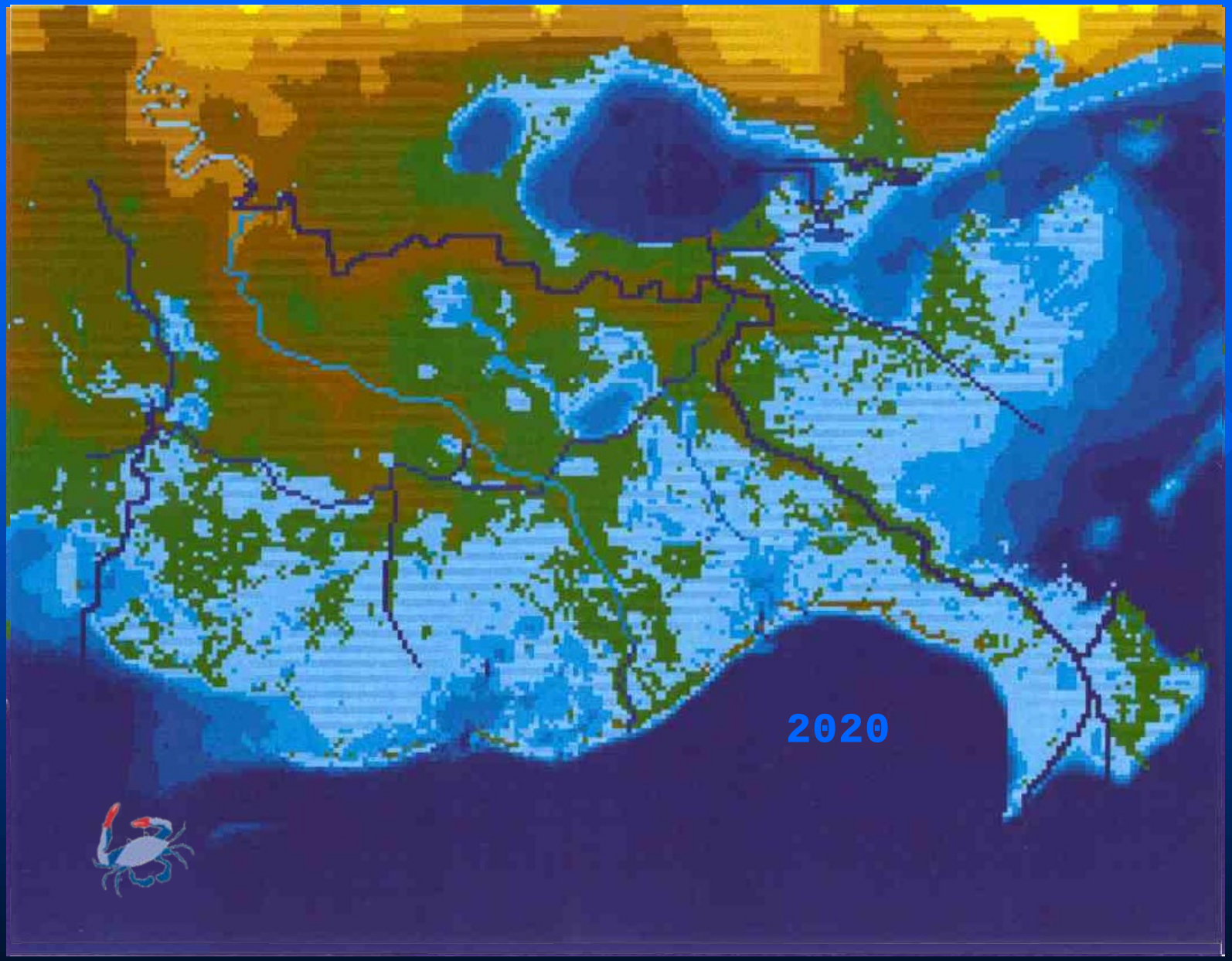
SUMMARY

Coastal Louisiana has lost an average of 34 square miles of land, primarily marsh, per year for the last 50 years. From 1932 to 2000, coastal Louisiana has lost 1,900 square miles of land, roughly an area the size of the state of Delaware. If nothing is done to stop this land loss, Louisiana is expected to lose another 700 square miles of land, or about equal to the size of the greater Washington D.C.-Baltimore area, in the next 50 years. Further, Louisiana accounted for an estimated 90 percent of the coastal marsh loss in the lower 48 states during the 1990s.



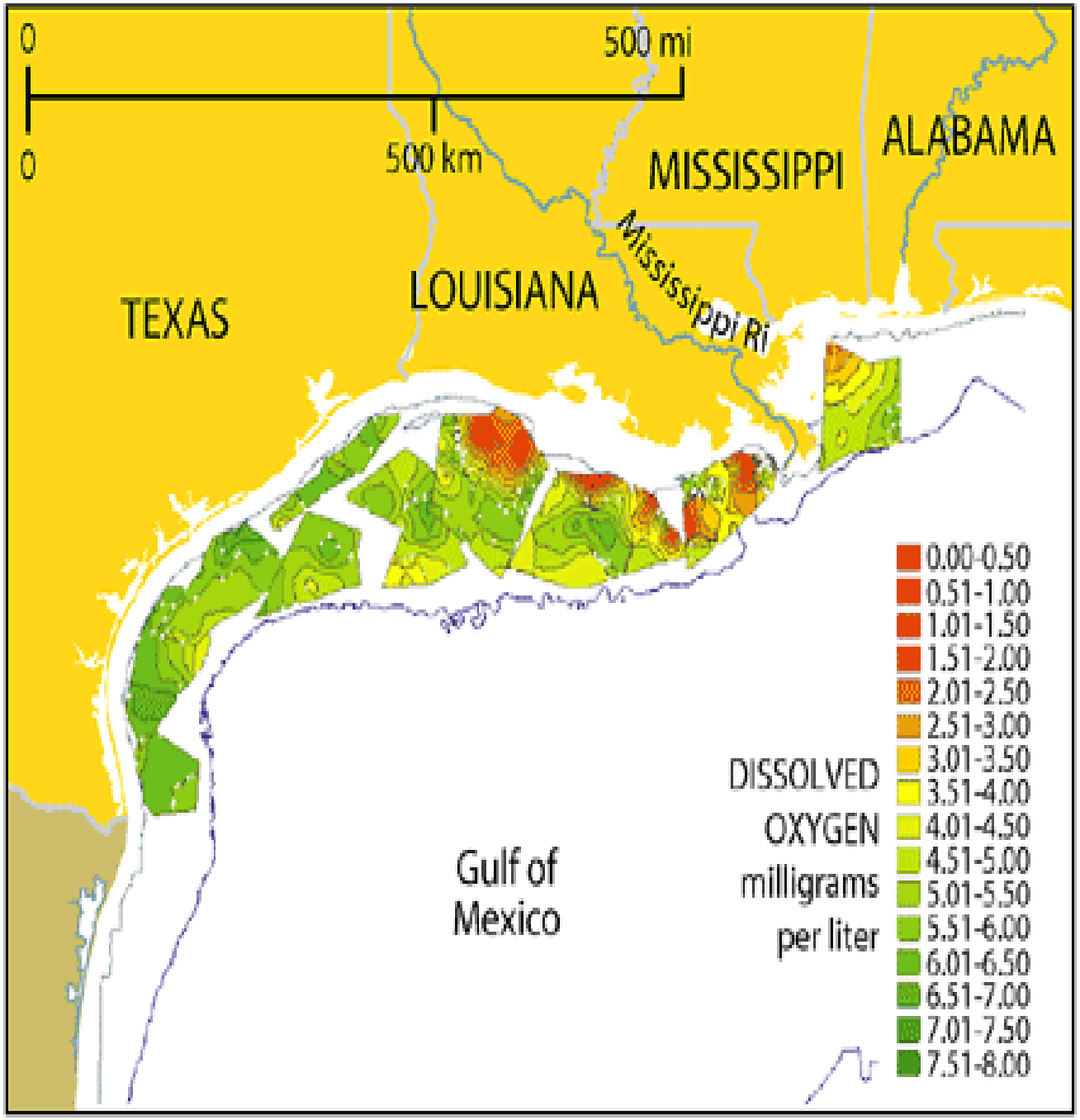
Prepared by:
U.S. Geological Survey
National Wetlands Research Center
Lafayette, LA

Background is 2000 Thematic Mapper panchromatic band.


2020

A stretching 'dead zone'

Orange and red areas of this map show the size of the dead zone in the Gulf of Mexico as of mid-July. Scientists say the dead zone is expected to continue growing, to cover 6,700 square miles by summer's end. The colors represent different oxygen levels found near the ocean floor: Oxygen is plentiful in dark green areas and severely depleted in dark red areas.



SOURCE: National Oceanic and Atmospheric Administration

RICH CLABAUGH – STAFF

Local Vulnerabilities & Hazards in Terrebonne-Lafourche

Submerged Fourchon Bridge (Leeville, LA)

"Ghost Oak" @ Point-aux-Chenes, LA

Murphy Oil Spill (Chalmette LA)

Port Fourchon Oil Receiving & Transport Hub / Lafourche Parish LA

Industrial channels disturb marsh integrity & alter salinity to detriment of grasses, trees, and productivity of the fishery

Tox & Risk Citizen Survey Items

- What significant damage did your community / region sustain because of Hurricanes Katrina &/or Rita?
- What is the most significant threat to Human Health in your area, post-Katrina &/or Rita?
- How has the hurricane evacuation, reentry and recovery process disrupted the social fabric of your area, and Louisiana, generally?
- What environmental health projects - involving collaborations among environmental scientists, health care professional, social service providers, and communities - do you think are most important to safeguard the health of people and the environment in your region and the state?

Tox & Risk (cont.)

- Describe your organization's response to this disaster. How have you modified your mission to make an effective response? How have these modifications affected your org's capacity to realize your original mission? (applicable only in interviews with members of environmental orgs)

Examples of Citizen Responses to Survey:

- ***Anne Rolfes*** (Louisiana Bucket Brigade @ former office of St. Bernard Citizens for Environmental Quality): extent of damage, redirection of environmental mission
- ***Wilma Subra*** (Subra Co. - Environmental Monitoring): potential toxicity of surge sludge sediments
- ***Michael Dardar / Clarice Friloux*** (United Houma Nation): identification of most significant environmental threat in local community @ Grand Bois)
- ***Brenda Dardar*** (United Houma Nation): possibility of mass relocation for Houma on coast
- ***Florence Robinson*** (LEAN): mental health effects on adults / children, un present / for future

General RISK Conclusions

- Variation in Risk Perceptions within single communities
- Variation in degree of acceptable risk
- Risk Anxiety and Risk Uncertainty identified as overarching problems
- Risk Uncertainty directly affected response plans and personal reentry decisions
- Risk Perceptions and Anxiety related to perceived reliability of agency or individual communicating interpretations of risk
- Risk Perception evolved as data and interpretations matured

Gaps in Environmental Health Information Affecting Risk Perceptions

- Effects of exposure to mold (respiratory / immuno-suppression)
- Extent of threat from water borne pathogens
- Water potability factors
- Flooding / overflow risk to surface water RCRA exempt waste pits
- Post-storm viability of water treatment facilities
- Dispersion patterns and health effects of toxic releases from various sources
- Levels of metals, diesel & hydrocarbon residues in desiccated sludge
- Respiratory and other health effects of wind borne sludge dust
- Transport of petrochemical toxicants & metal residues moved by storm surge

Gaps In Information (cont.)

- Integrity of Superfund sites & brownfields after wind damage and submergence
- Post wind and storm surge integrity of petrochemical facilities
- Emissions & flaring during petrochemical facilities shut down / start up process as storm consequence
- Debris: collection, transportation, disposal sites
- Need for specific reentry gear not clearly indicated
- Mosquitoes, disease vectors
- Effects of damage to coastal marshes on subsistence food supply / health of estuarine eco-system
- Massive loss of marsh / wetlands (hurricane dampening effect)
- Depression, disorientation, post-traumatic stress effects
- Effects of disaster stressors on most vulnerable segments of population

Gaps In Information (cont.)

- Location of "permanently temporary" FEMA housing proximate to point sources of air toxics or waste disposal areas - is this a problem?
- Permanent reconfiguration of regional political demographic with consequences for redevelopment policy and environmental justice

Community Research Project "Wish List"

- General health monitoring using combination biomarker assay / health effects survey with rescue & recovery workers
- Differentiation of acute / chronic health effects in recovery workers based on time period of response, length of time in affected areas, proximity to documented environmental impact areas, etc.
- Systematic bio-monitoring of vulnerable populations
- Comprehensive structural survey of industrial sites in affected area
- Monitoring possible infiltration of potable water supplies by petrochemical releases, effluents and waste disposal site residues
- Multi-agency efforts to create more effective / realistic inter-coastal / marshland reclamation policy

Community Project Wish List (cont.)

- Public forums on waste disposal efforts to address removal, storage / sequestration, and/or incineration methods
- Occupational risk survey of workers - including documented & undocumented Latinos - to establish baselines, exposure pathways, levels of protection and instruction is uses of protective gear.

Genesis of Project CEHRO aka Hurricane Readiness: a Way of Life on the Bayou

Isle de Jean Charles after Rita storm surge

- Survey results & networking during survey process
- Environmental monitoring from various sources
- Projections of potential for environmental damage from future storms

Project Locus:

South Terrebonne - Lafourche parishes

Primary Impact: ***storm surge*** from Hurricane Rita

Houma evacuees from Plaquimines

St. Bernard, Jefferson parishes

extensive land-loss, southern-most

Cooperating Communities & Organizations

- Larose
- Cut Off
- Chauvin
- Galliano
- Montegut
- Dulac
- Pointe-aux-Chenes
- Isle de Jean Charles
- Houma
- Golden Meadow
- Grand Bois
- Mathews

- S. Lafourche Levee District
- S. Lafourche Unified School District
- United Houma Nation Vocational Rehabilitation
- Bayou Grace
- Louisiana Spirit
- Catholic Social Services
- Knights of Columbus
- Les Reflections du Bayou
- BTNEP
- Gulf Restoration Network

Project Focus: outcome of collaborative framing process

- Coastal erosion / subsidence
- Evacuation
- Mental health (PTSD / developmental)
- Environmental health:

1. Mold / respiratory health effects
2. ***Vibrio vulnificus*** / sewage related pathogens
3. Toxic effects of sludge sediment
4. Epidemiology of health effects
5. Exposure Pathways: fate, transport, route

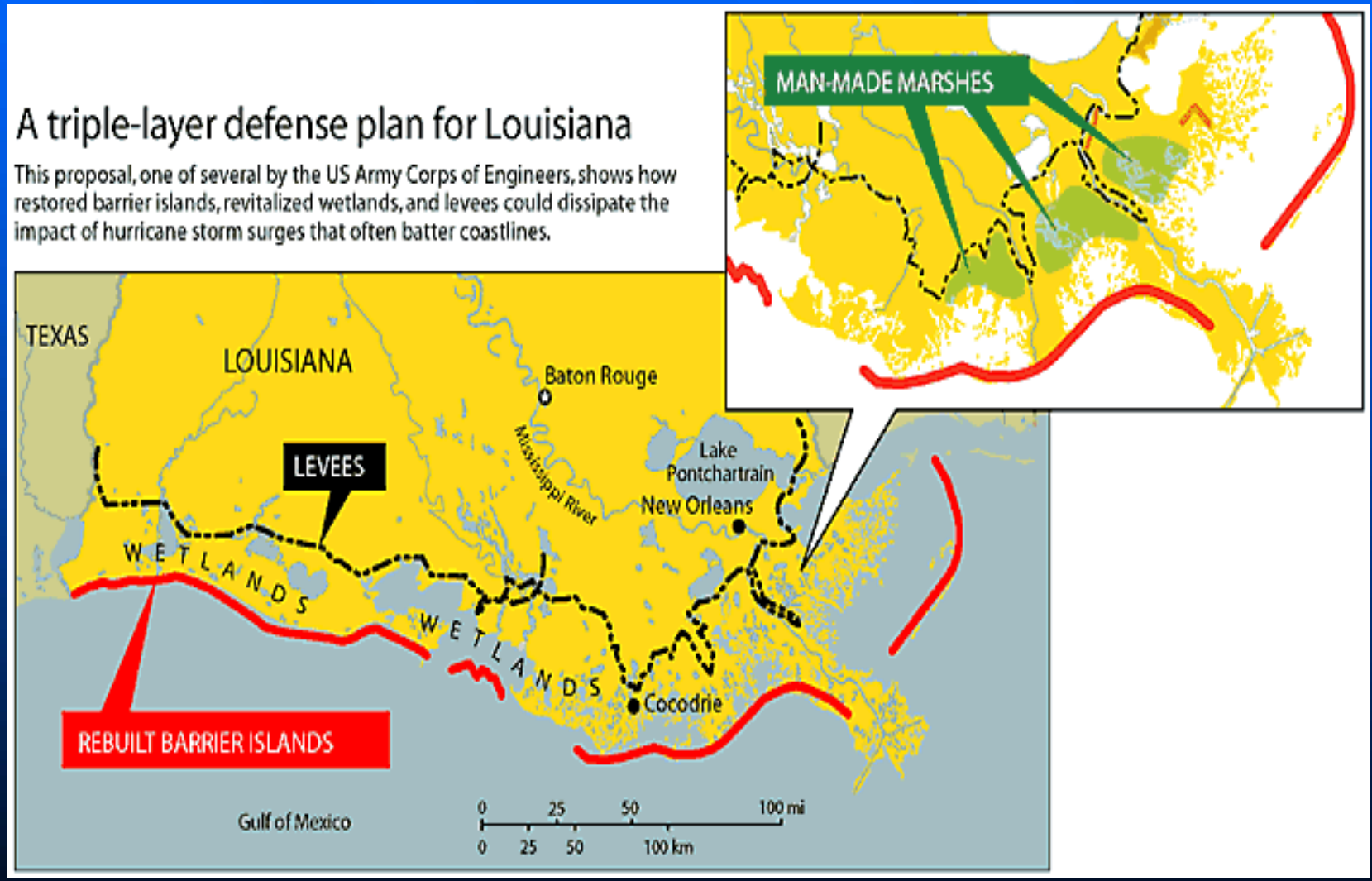
- Community Risk Assessments / Risk Communication
- Networking for coastal policy change

Project Process

- Collaborative production of community advocate handbook
- Intensive environmental health / mental health workshop with group of community advocates / seed educators
- Use of “Tox & Risk” image making & Boal theatre techniques
- Community Awareness seminars in Houma & Galliano - co-produced by workshop facilitators & participants
- Planning for advanced level workshops / productions

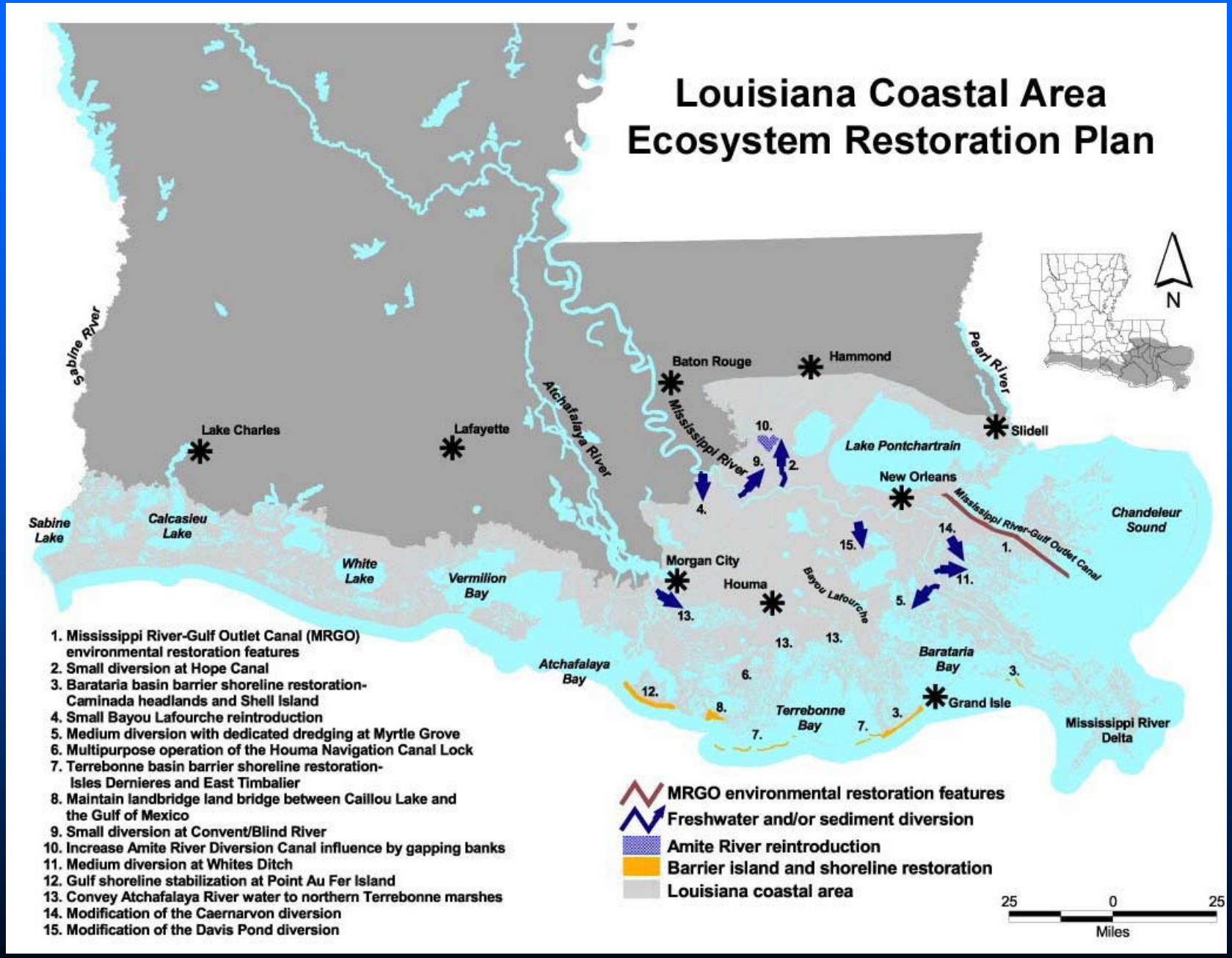
Overview of Coastal Restoration Proposals

Restoring Louisiana's 1st Line of Defense



Morganza to the Gulf


Donaldsonville, LA to the Gulf of Mexico
Possible Hurricane Levee Alignments
Donaldsonville
Laplace
MISSISSIPPI
RIVER
St. John Parish
St. James Parish
Lac Des Allemands
Metairie
West Bank & Vicinity Hurricane Protection
Jefferson Parish
Lake Cataouatche
Des Allemands
Thibodaux
Lafourche Parish
St. Charles Parish
BAYOU
LAFOURCHE
Lake Salvador
Houma
Larose
GIWW
Larose to Golden Meadow Hurricane Protection
Terrebonne Parish


Louisiana Coastal Area
Ecosystem Restoration Plan
N
Sabine River
Lake Charles
Lafayette
Atchafalaya River
Baton Rouge
Hammond
Pearl River
Slidell
Mississippi River
Lake Pontchartrain
New Orleans
Mississippi River-Gulf Outlet Canal
Chandeleur Sound
Sabine Lake
Calcasieu Lake
White Lake
Vermilion Bay
Morgan City
Houma
Bayou Lafourche
Atchafalaya Bay
Barataria Bay
Terrebonne Bay
Grand Isle
Mississippi River Delta
1. Mississippi River-Gulf Outlet Canal (MRGO) environmental restoration features
2. Small diversion at Hope Canal
3. Barataria basin barrier shoreline restoration- Caminada headlands and Shell Island
4. Small Bayou Lafourche reintroduction
5. Medium diversion with dedicated dredging at Myrtle Grove
6. Multipurpose operation of the Houma Navigation Canal Lock
7. Terrebonne basin barrier shoreline restoration- Isles Dernieres and East Timbalier
8. Maintain landbridge land bridge between Caillou Lake and the Gulf of Mexico
9. Small diversion at Convent/Blind River
10. Increase Amite River Diversion Canal influence by gapping banks
11. Medium diversion at Whites Ditch
12. Gulf shoreline stabilization at Point Au Fer Island
13. Convey Atchafalaya River water to northern Terrebonne marshes
14. Modification of the Caernarvon diversion
15. Modification of the Davis Pond diversion
MRGO environmental restoration features
Freshwater and/or sediment diversion
Amite River reintroduction
Barrier island and shoreline restoration
Louisiana coastal area
25 0 25
Miles

Project Process

- Collaborative production of community advocate handbook
- Intensive environmental health / mental health workshop with group of community advocates / seed educators
- Use of “Tox & Risk” image making & Boal theatre techniques
- Community Awareness seminars in Houma & Galliano - co-produced by workshop facilitators & participants
- Planning for advanced level workshops / productions

Project Timeline

- 2005 (October – November): scoping outreach to high impact areas in south Louisiana / east Texas
- 2005 (November): scoping data incorporated into COEC presentation (Diamond, P.) @ NIEHS Center Directors Meeting (Vanderbilt)
- 2006 (Jan.-Mar.): on-site planning for Project CEHRO (using CBPR model)
- 2006 (August): hosted St. Bernard CfEQ / LABB photo exhibit @ GAC “Life in Chalmette after Katrina”
- 2006 (September): implement phase 1 – community advocates training workshop & public seminars (Gray, Houma, Galliano, LA)
- 2007(March): implement phase 2 – follow-up community advocates seminar (Chauvin LA)
- 2007 (May): JHCPU / “Notes from the Field” & video data record from scoping project
- 2007(May): application with T.e.j.a.s. for Rockefeller Funding to replicate project in Port Arthur TX

Content Focus for Next Phase (Port Arthur TX):

- Exploration of issues pertaining to vulnerable populations (mental & environmental health)
- Advocacy to address inadequate health care access
- Community hazards assessment & mapping
- Risk perception & communication
- Factors affecting susceptibility / expression of health effects
- Hands-on coastal restoration / estuary protection
- HAZ abatement training / NIEHS (in advance of storms)
- Campaign for containment of home toxics during storm preparation
- Coastal advocacy: state, regional & federal levels
- Expansion of inter-community networks

Project CEHRO: Facilitators & Leaders

- Rochelle Ste. Marie (Innerworks Inc.)
- Greg Harding (Louisiana Spirit)
- Windell Curole (S. Lafourche Levee District)
- Wilma Subra (Subra Co.)
- Warren Sapp, Dr. Reverend (Bayou Grace Community)
- Lanor Curole (United Houma Nation)
- Michael Robichaux, M.D. (area physician)
- Sharon Petronella, PhD. (NIEHS / UTMB @ Galveston)
- Aaron Viles (Gulf Restoration Network)
- John Ettinger (EPA / US Army Corps Eng.)
- John Sullivan (NIEHS / UTMB)
- Courtney Pellegrin (Bayou Grace / Chauvin)